



Kentucky Statewide Assessment of Forest Resources and Strategy

**A Comprehensive Analysis and
Plan for Action**

June 2010

Front cover: Devil's Hollow, Red River Gorge Geological Area, Daniel Boone National Forest.
(photo by Tim Brown, Kentucky Division of Forestry).



The Commonwealth of Kentucky celebrates a rich history rooted in its natural environment and a forest resource that is diverse and productive. The citizens of Kentucky receive multiple benefits from our extensive forestlands, including timber and nontimber forest products, recreational opportunities, e.g. hiking, hunting, and camping, and clean water and air. With so much at stake and because the general public, policymakers and managers need information about our forestlands, we prepared the **Kentucky Statewide Assessment of Forest Resources and Strategy** to serve as a resource for all partners involved in forestland management activities.

We would like to thank the division employees and all partners who assisted in the development of this document and we look forward to working with each of you in the coming years.

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Kentucky Statewide Assessment of Forest Resources
A Comprehensive Analysis and Plan for Action

June 2010

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Acronyms

ACCF	American Chestnut Cooperators' Foundation
ARRI	Appalachian Regional Reforestation Initiative
ATFS	American Tree Farm System®
BMP	Best Management Practice
BTU	British Thermal Unit
ccf	Hundred cubic feet
CARS	communities at risk
CRP	Conservation Reserve Program
CREP	Conservation Reserve Enhancement Program
CWPP	Community Wildfire Protection Plan
DBNF	Daniel Boone National Forest
EAB	Emerald Ash Borer
EQIP	Environmental Quality Incentives Program
FIA	Forest Inventory and Analysis
FLA	Forest Legacy Area
FLP	Forest Legacy Program
FSC	Forest Stewardship Council
HLCF	Kentucky Heritage Land Conservation Fund
HWA	Hemlock Woolly Adelgid
HUC	Hydrologic Unit Code
KAR	Kentucky Administration Regulations
KDF	Kentucky Division of Forestry
KDFWR	Kentucky Department of Fish and Wildlife Resources
KDOW	Kentucky Division of Water
KFCA	Kentucky Forest Conservation Act
KFHTF	Kentucky Forest Health Task Force
KRS	Kentucky Revised Statute
KSNPC	Kentucky State Nature Preserves Commission
KYTC	Kentucky Transportation Cabinet
MACED	Mountain Association for Community Economic Development
mcf	thousand cubic feet
MGD	million gallons per day
NRCS	Natural Resources Conservation Service
NTFP	Nontimber forest products
SFI	Sustainable Forestry Initiative®
SFM	Sustainable forest management
TACF	American Chestnut Foundation
USEPA	United States Environmental Protection Agency
USFS	United States Department of Agriculture Forest Service
WMA	Wildlife Management Area
WRP	Wetlands Reserve Program
WUI	Wildland-Urban Interface

Glossary

Acre - An area of land measuring 43,560 square feet. A square 1-acre plot measures 209 feet by 209 feet; a circular acre has a radius of 117.75 feet.

Aesthetics - Sensitivity to or appreciation of the forest's beauty through recognition of its unique and varied components, or beauty through an orderly appearance.

Afforestation – Planting seeds or trees to make a forest on land which has not been a forest recently, or which has never been a forest.

Agroforestry – An integrated approach of using the interactive benefits from combining trees and shrubs with crops and/or livestock. It combines agricultural and forestry technologies to create more diverse, productive, profitable, healthy and sustainable land use systems.

Attrition – a type of forest fragmentation in which the size of a forest tract gradually shrinks until it is removed entirely.

Best management practices (BMPs) - A method or combination of methods that is an effective and practical way (technologically and economically) to prevent or reduce pollution.

Biodiversity - the number and variety of species of plant and animal life within a region.

Biota – classifications of plant or animal life.

Carbon sequestration – A geoengineering technique for the long-term storage of carbon dioxide or other forms of carbon.

Clear-cutting - A silviculture system where all trees in a specified area are harvested in one operation.

Crown - Technically, the point where the tree trunk meets the roots of a tree. Commonly, it refers to the leaves and branches in the uppermost part of the tree.

Detritus – Non-living particulate organic matter which is often decomposed.

Dissection – A type of fragmentation in which a tract of land is divided.

Down woody debris – Woody pieces of trees and shrubs that have been uprooted (no longer supporting growth) or severed from their root system, not self supporting, and are lying on the ground.

Duff - The partially decomposed organic material of the forest floor beneath the litter of freshly fallen twigs, needles and leaves.

Ecosystem - An interacting system of living organisms, soil and climatic factors. Forests, wetlands, watersheds, ponds, prairies and communities are ecosystems.

Edge habitat - the margin where two or more different habitat types meet.

Environment - The complex surroundings of an item or area of interest, such as air, water, natural resources and their physical conditions (temperature and humidity).

Erosion - The wearing away of the land surface by water, wind, ice or other geologic agents and by such processes as gravitational creep.

Eutrophication - The process by which a body of water becomes enriched in dissolved nutrients (as phosphates) that stimulate the growth of aquatic plant life usually resulting in the depletion of dissolved oxygen.

Evapotranspiration - The combined evaporation of water into the atmosphere from water, soil, and plants.

Exotic – From another part of the world, non-native.

Extirpated – When a species ceases to exist in a given area, but still exists elsewhere.

Extinct - When a species ceases to exist anywhere.

Forest – any area where trees and other woody vegetation is present.

Forest diversity - Different types of forest communities and numbers of species within forests.

Forest loss - The conversion of forestland to some other land use.

Forest structure - The complexity of the vertical and horizontal forest.

Forestland - Land at least 10 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for non-forest use. The minimum area considered for classification is 1 acre. Forested strips must be at least 120 feet wide.

Fragmentation - The process by which large continuous tracts of forestland are broken into smaller, disconnected units.

Hardwoods - Dicotyledonous trees, usually broadleaf and deciduous.

Harvesting - Felling, loading and transporting forest products, roundwood or logs.

Herbaceous – a non-woody type of plant which grows along the forest floor and has leaves and stems which die down at the end of the growing season to the soil level.

Herbicide - Any substance or mixture of substances intended to prevent the growth of or destroy terrestrial or aquatic weeds.

Hydrologic Unit Code – A series of numbers in a nested hierarchy that are used to identify a watershed size and location. The greater number of digits in the identification number, the smaller the area. The first two digits identify the region of the United States. An eight-digit hydrologic unit code typically identifies a basin and averages around 703 square miles. A 14-digit code is typically the smallest watershed identified.

Impervious – surface that is not passable for water

Invasive species – species, which is often non-native, whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

Karst - an irregular limestone region with sinkholes, underground streams, and caverns.

Log - A primary forest product harvested in long, primarily 8-, 12-, and 16-foot lengths.

Mesophytic – Area where terrestrial plants that are adapted to neither dry nor wet environments grow.

Native species - A species that is a part of the original fauna or flora of the area in question.

Old-growth forest - a forest that contains trees that have attained great age and exhibits unique ecological features.

Organic matter - Plant and animal residue in the soil in various stages of decomposition.

Parcelization - The change in ownership patterns when larger forested tracts are divided into smaller parcels owned by several owners.

Perforation – a type of fragmentation in which openings are created inside forested tracts.

Physiographic – physical geography

Prescribed fire - Controlled application of fire to wildland fuels in either their natural or modified state, under specified environmental conditions that allow the fire to be confined to a predetermined area. The application produces the fire behavior and fire characteristics required to attain planned fire treatment and resource management objectives.

Pulpwood - A roundwood product that will be reduced to individual wood fibers by chemical or mechanical means. The fibers are used to make a broad generic group of pulp products that includes paper products, as well as fiberboard, insulating board, and paperboard.

Regeneration - Process of replacing old trees with young through harvest or other means.

Riparian - pertaining to the banks of a stream, river or pond.

Roundwood - Logs, bolts, or other round sections cut from trees for industrial manufacture or consumer uses.

Runoff - Portion of precipitation that flows from a drainage area or in open channels.

Saw-log - A roundwood product, usually 8 feet in length or longer, processed into a variety of sawn products such as lumber, cants, pallets, railroad ties, and timbers.

Sedimentation - process that deposits soils, debris and other materials in bodies of water

Seedtree cut – A silviculture practice in which most trees are removed and only a few trees are left behind to regenerate an even-aged stand.

Seedling - A small, young tree, less than 3 years old.

Shelterwood – a silviculture method that involves removing trees in a series of two or more cuttings so new seedlings can grow from the seed of older trees

Silviculture - the art, science, and practice of caring for forests to accomplish desired objectives.

Softwood - Coniferous trees, usually evergreen, with leaves that are needles or scale like.

Soil - Unconsolidated mineral and organic material on the immediate surface of the earth, serving as a natural medium for the growth of plants.

Stand - A group of trees defined by human disturbance or by common species composition and structure.

Stream - A body of concentrated flowing water in a natural low area of land. 1. "Ephemeral stream" means a stream that flows only during and for short periods following precipitation and flows in low areas that may or may not have a well-defined channel. 2. "Intermittent stream" means a stream that flows only during wet periods of the year (30 percent to 90 percent of the time) and flows in a well-defined channel. 3. "Perennial stream" means a stream that flows throughout a majority of the year (greater than 90 percent of the time) and flows in a well-defined channel.

Sustainable forest management – management in an attempt to attain balance between society's increasing demands for forest products and benefits including non-consumptive uses, and the conservation and maintenance of forest health and diversity.

Thinning - Cutting or removing certain trees to allow those remaining to grow faster. Usually a commercial operation in younger stands that brings an income to the landowner while improving a forest.

Timber product output - The total volume of roundwood products from all sources plus the volume of byproducts recovered from mill residues (equals roundwood product drain).

Tree - Woody plant having one erect perennial stem or trunk at least 3 inches diameter at breast height, a more or less definitely formed crown of foliage, and a height of at least 13 feet (at maturity).

Veneer log - A roundwood product either rotary cut, sliced, stamped, or sawn into a variety of veneer products such as plywood, finished panels, veneer sheets, or sheathing.

Watershed - Area within which all runoff collects into a single stream or drainage system, exiting through a single mouth or outlet.

Wetland – An ecosystem that is inundated or saturated with water for long enough periods to produce hydric soils and support hydrophytic vegetation.

Wildland - a natural environment that has not been significantly modified by human activity

Wildland-Urban Interface - area in which residences border or are intermixed with undeveloped wildland vegetation.

Wildfires - Uncontrolled fires occurring in forestland, brushland, and grassland.

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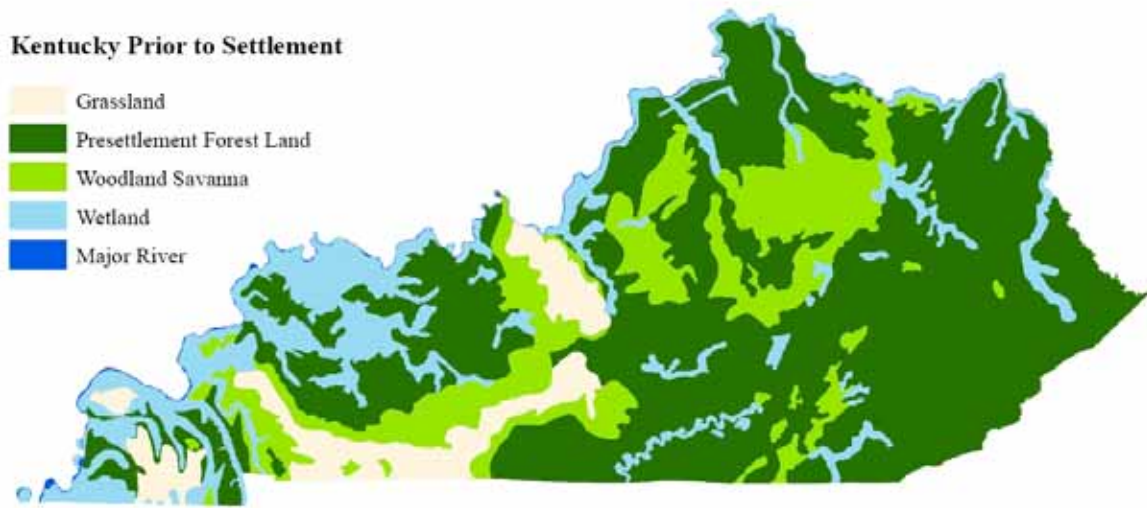
INTRODUCTION

What is the value of Kentucky's forests?

As Kentuckians answer this subjective question, our culture, attitudes, interests, and philosophy of life will determine our perspective on forests and their true value. When we look at the trees around us, we each see different things. For this reason, hundreds of different definitions of forests, also called woodlots or woodlands, distinguish different attributes. Some see the number of board feet and the current market timber value. Others see a place for their children to swing in a tire or a great site for a hunting stand. Some value forests for the seclusion and quietness, and others for adventure tourism. Where a biologist might see a detrimental invasive species, a landscaper sees an opportunity for brilliant autumn color. Some Kentuckians value forests because they are homes for animals while others value the wood for their fireplace and the shade for their roof. Some value the aesthetics of a landscape to paint while others see a future subdivision. How would the stories of Daniel Boone or the feud between the Hatfield's and McCoy's be different without forests? Should we protect forests because of the long-term effects on climate change or harvest them for the short-term use for paper, furniture, baseball bats, and holiday decorations? "Seeing the forest for the trees" would be an easy task if there was agreement on the best end uses, and the greatest value, of Kentucky's forests. Some uses are mutually exclusive while others are not.

Historically, the way in which the forests have been valued has varied as the attitudes of the people and resource itself have changed. In the late 1700s, botanist F. A. Michaux showed his awe of Kentucky's forests by saying, "In more than a thousand leagues of the country over which I have traveled at different epochs in North America, I do not remember having seen one to compare with the latter (Kentucky) for vegetative strength of the forests."¹ Thomas Crittenden Cherry describes Kentucky forests of that same period as "dense forests crowded to the water's edge and reaching back in endless profusion--through valleys and uphill slopes--were matted many places with a tangled undergrowth of bushes, briars and vines that made difficult, a passage even for the wild animals. Giant forests of oak and tulip, beech and ash, sycamore and linden, cedar and pine, and many branches spread a canopy through which the rays of the sun could scarcely penetrate, producing twilight effects even at high noon."² Such descriptions paint a picture different than what we see today, and the attitudes of the people were shaped accordingly.

The Native Americans valued these strong forests, carefully managing them through burning to provide berries, nuts, and wild game to supplement their maize-based diet as well as for energy and shelter. The pioneer settlers also valued the energy, building materials, and hunting grounds that the forests supplied, but saw greater value in clearing the land for agricultural use. They believed the abundance of the forest was inexhaustible.³ According to one estimate, 24,320,000 acres of the total 25,669,760 acres in Kentucky (almost 95%) were forested at that time.⁴ Figure 1 shows another geographic estimate of how the state may have looked prior to European settlement. Whatever the prior forest coverage, by 1875 only half the state was estimated to still be heavily wooded, so a large portion of Kentucky's forests had been cleared by that time.⁵



(Source: KSNPC)

FIGURE 1 – KENTUCKY PRIOR TO SETTLEMENT

An account of John Barton, Kentucky's first State Forester (1912), indicates that he believed "that most of the people ... wondered why anyone should be concerned about the forests. He and others believed that the idea of protecting the forests for their own intrinsic values was a foreign concept to many people, especially to those in the forested country in the hills and up in the hollows."⁶ Believing that the resource was endless and the land could be better used for agriculture, many subsistence farmers cleared their property of trees and endured the hardships of rafting the logs by river during the rainy season to bring in some extra cash from the nearest mill. Others not taking the risk of selling the timber would simply practice yearly "burning off the woods" while in the process "doing almost irreparable injury to the forests" such that "in many places... the old forest is rapidly dying out with age, and there is nothing coming on to take its place."⁶ Over 2% of total acres in Kentucky were burned in 1880 alone.⁷ The first survey of forest resources in Kentucky (1907) found that burning in combination with overcutting and high-grading of the choicest trees (not to mention the impacts of free range cattle and hogs) had reduced many areas such that only scrub trees could grow, and if the treatment continued all original timber would be exhausted in fifteen years!⁶

According to the 1966 forestry report, depletion of the early timber resources was due to five major causes: (1) Repeated, short-term agricultural clearing on hillsides; (2) continuous logging for over a century of the best stock; (3) the overcutting of mine leaseholds to prevent loss of profit; (4) fire including natural and man caused; and (5) unrestricted livestock grazing.⁶ Underlying each of these causes is a prevalent view that land was more valuable when the trees were harvested or simply removed. Food on the table was more valuable than trees on the land.

However, because of the rapid deterioration of the forest resources, the attitudes towards the forest resources began to change in the years to follow, albeit slowly at first. The value of forestland became less about timber production and more about other uses. The first laws concerning forest conservation and fire prevention were passed in 1912 shortly after the presidency of Theodore Roosevelt, who vocally advocated conservation along with Gifford Pinchot, the first Chief of the United States Forest Service (USFS). The Kentucky Division of Forestry (KDF) was created in the same year. In Kentucky, the peak years of timber cutting to supply the building materials for railroads and cities, energy for cooking and heating, charcoal for

iron smelting, and supplies for World War I ended around 1920. Research efforts began to analyze the timber consumption rates and future supplies. Protection of forestland began with the first state forest, the Kentenia State Forest on the south side of Pine Mountain, in 1919. State nurseries supporting reforestation efforts were first established in 1914. Progress also began to be made in fire control. However, when funding waned in 1920, the activities of the state forest service generally came to a halt, not functioning fully again until the 1930s.

In the 1930s and 1940s, the creation of multiple forestry groups and the changes in thought and practice that they brought about signaled an increased concern about protecting and maintaining forest resources. The Central States Forestry Congress met in Kentucky for the first time in these years, and the Kentucky Forestry Association was created. The activity of the Civilian Conservation Corps brought much needed infrastructure including roadways, bridges, fire towers, parks, telephone lines, tree plantings, water controls, and soil erosion control features. Conservation education was spread throughout the state through the state fair, a traveling motion picture projector, radio broadcasts, and other programs. These organizations and activities heightened the awareness of the public to the forestry problems as well as management techniques, wise use, and the importance of forest protection.

In the years after World War II, the management and protection efforts of forest resources were in full swing. A statewide fire protection plan was finally in place by 1966. Reforestation programs rapidly grew as six additional State Forests were acquired and youth camps were utilized to supply labor for the tree nurseries. In 1950, a uniform stock law was finally passed prohibiting the damage from free ranging cattle in forested areas.⁶ The Boone and Crockett Club and other hunting groups began to exert some clout as deer and turkey populations began to swell again due to management of the scant populations remaining as of the 1930s. With improved agricultural techniques and increased yields, the amount of land used for agriculture stabilized. Recreational use of forest resources had and continues to increase. Thus, although the use of forests for products and services has remained, the value of the forests for non-consumptive use has expanded.

The efforts which began in the 1940s to the 1960s have had a dramatic effect on the forests of today, for the majority of forest stands today were initiated in that time and more than 68% of current forests are more than 45 years old.⁸ The total forestland steadily increased in Kentucky from near 11.5 million acres in the 1940s to near 12.7 million acres in 1988.⁸ Only since 1988 has the forestland decreased, mostly due to land use conversion, to the current level of approximately 12 million acres.⁸

Forests currently occupy approximately 47% of Kentucky's total land area as shown in Figure 2. The forestland is 72% oak-hickory forest, 9% oak-pine forests, and 5% softwood forests though red maple, sugar maple, and yellow-poplar are the three most common trees respectively.⁸ Private individuals own 78% of the forestland in Kentucky with other owners including 11% corporate, 9% government, and 2% forest industry.⁸ The question remains however, what is the value of these forests to the current owners?

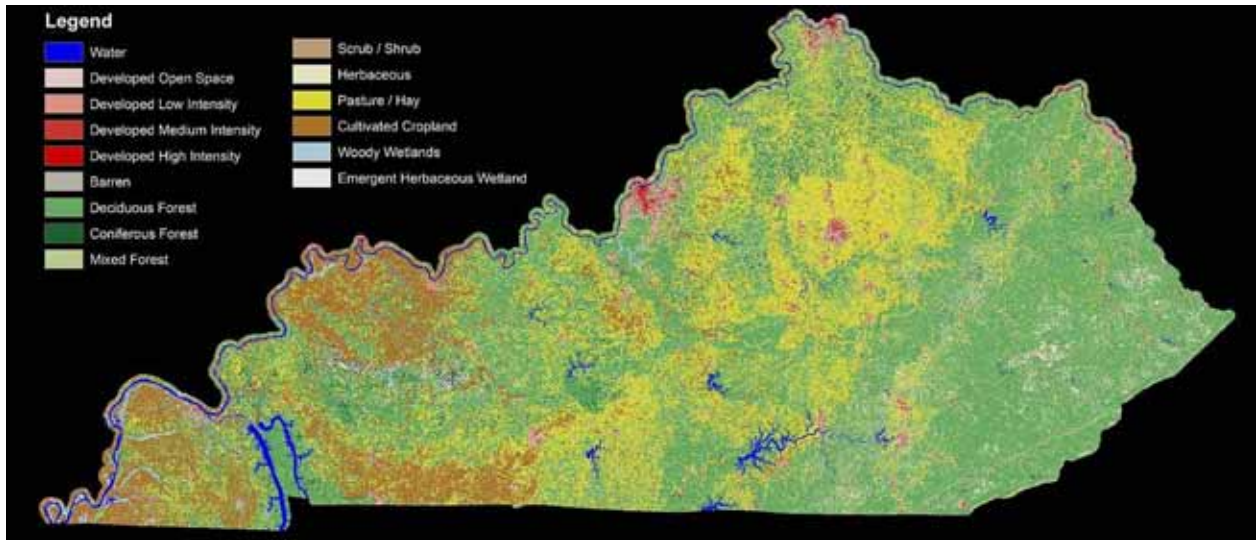


FIGURE 2 – CURRENT LAND USE IN KENTUCKY

From the history of Kentucky's forests, we can see that there is no single statement regarding the value of Kentucky's forests. Value, like beauty, is in the eye of the beholder. Attitudes towards Kentucky's forests have changed, diversified, and shifted throughout Kentucky's history and will continue to do so as the concerns of our culture, the status of the resource, and the desired end uses fluctuate in the future. Will the concerns over climate change and carbon credits persist? Will the recreational use of forestland continue to increase? Will future droughts and water shortages in the Bluegrass Region bring to a head the importance of forestlands in a watershed in providing a clean regulated supply of water? How will the interplay between urban areas and forestland use develop? Significant threats to forests, such as insects and diseases, catastrophic fire, and loss of forested landscapes to development, coupled with pressure placed on local economies by the increasingly global nature of the forest products industry, point to the need for more progressive strategies for managing forest resources. Although these future concerns are difficult to project, the seeds we plant today in our decisions concerning Kentucky's forest resources will not grow to maturity until the years of 2030 to 2040. In order to provide the best plan for the future, the objective of the Kentucky Forest Resource Assessment is to assess the conditions, trends, threats, and priorities of the state's forests such that we can "see the forest for the trees" in developing long and short-term strategies for Kentucky's valuable forest resources.

Kentucky Statewide Forest Assessment – Background

The Food, Conservation, and Energy Act of 2008 requires that all states evaluate their forest resources and, in coordination with stakeholders, develop strategies for addressing forestland issues. At a minimum, the bill requires that the assessment and strategy includes:

- Conditions and trends of our forest resources
- Threats to our forestlands and resources in Kentucky consistent with national priorities (conserve, enhance and protect forests)
- Areas or regions of Kentucky that are a priority
- Any multi-state areas that are a regional priority (areas that are a priority to us and to a state or states that border us)
- Long-term strategies to address threats to our forest resources

In order to meet these requirements, the KDF chose to focus its assessment on the most prominent forestland issues while also generally addressing all aspects of forest resources. In order to identify the key issues, the KDF reviewed reports and minutes from summits, meetings, and conferences over the past 15 years and identified 10 issues that routinely emerged. The KDF organized these 10 issues into an online survey in which 1,884 participants from every region of Kentucky ranked the five most important issues. The issues with the highest ranking by the most respondents included:

1. Forest Health
2. Water Quality and Quantity
3. Forest Loss and Fragmentation
4. Forest Management, and
5. Funding

These five issues stood out as the most important among the other issues identified, which include public awareness, urban and community forestry, unlawful activity (*i.e.*, timber theft and trespass), wildland fire, forest economy, mountaintop removal, public access, prescribed fires, and other corollary issues such as renewable energy, carbon sequestration, and ecosystem services. Why are these issues considered so important? Part 1 of this assessment provides an overview of the current status of the public benefits, resources, key conditions, threats, and opportunities associated with the top five forest issues in Kentucky. Here is a short summary for each of the top issues:

Issue 1: Forest Health

In the past several decades the threats to Kentucky's forestlands have steadily increased. A vast majority of the threats are the result of the introduction of diseases and non-native invasive plants and insects. The impacts of these pests along with air pollution, wildfires, increased accessibility, and poor management and logging practices continue to compromise forest productivity and quality in Kentucky. Effective and economically feasible management strategies must be developed and implemented to address these threats.

Issue 2: Water Quality and Quantity

Although several factors have an impact on water quality and quantity, Kentucky's forestlands play a key role in protecting and enhancing water quality. The beneficial chemical, physical, and biological effects of forests on the waters of Kentucky include filtration of pollutants, stabilizing the water supply, and providing habitat for aquatic ecosystems. Considering the high degree of impairment of the waters of Kentucky, particularly from sedimentation, effective management of forest resources is critical to improving and maintaining the life giving resource.

Issue 3: Forest Loss and Fragmentation

Following steady increases in the forestlands since the 1940s, the period between 1988 and 2003 marked a loss of 137 acres/day. Road building, agriculture, mining, and urban development have all contributed to fragmentation and loss of Kentucky's forest resources. As more people are migrating from an urban to a rural environment and large tracts of land are parceled for development or division of the family inheritance, forestland gradually has been subdivided into smaller tracts. The loss and fragmentation impacts the integrity, economic vitality, and biological diversity of our forests. Smaller forest properties are expensive to manage and do not provide the wildlife habitat, ecosystem services, or recreational getaways of larger tracts.

Issue 4: Forest Management

Whether the desired end use is wildlife habitat, timber, improved water quality, carbon sequestration, recreation, or all of the above; proper management is necessary to achieve the desired use. Despite Kentucky's ranking amongst the top 10 states in the production of hardwood lumber, and hardwood and total wood exports⁹, the vast majority of forest landowners do not manage their lands for timber production or any desired use. Because private landowners own the majority of lands in Kentucky, additional strategies must be developed to encourage them to manage their forest resources in a responsible and sustainable manner.

Issue 5: Funding

The total economic importance of Kentucky's forests is nearly \$8.7 billion annually with one of the largest timber and non-timber forest product economies in the south. However, support for these industries is at risk as the USFS's State and Private Forestry Programs have faced as much as an 80% reduction in some programs in combination with the effects of the 2001 and 2009 recession. As the KDF has been forced to reduce staffing, the need to meet the needs of Kentucky's forests is ever growing including assisting a growing number of private owners with planning, monitoring and training master loggers, reducing timber theft, increasing educational efforts, and fighting the nation's highest rate of arson fires. Proper management does not come without a cost, and this has never been more so than it is today.

The second part of this assessment builds on the information presented in part one by defining priority forest areas within Kentucky and in multi-state areas in order to focus implementation efforts for each issue towards the areas in which the need is the greatest. These priority areas are described along with the process by which these areas were selected.

In the final, third part of this assessment, the long-term strategies to address the threats to Kentucky's forest resources are examined in relationship to the top five issues and the priority areas. Goals, objectives, and tactics are developed for each issues in a manner consistent with the national priorities of conserving, protecting, and enhancing our forest resources.